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FOOD AND NUTRITIONAL SECURITY OF PREGNANT WOMEN IN RURAL AREAS: THE CASE OF DISTRICT LAHORE, PAKISTAN

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Abstract

Nutritional status of mother is an important contributor to good pregnancy outcome. This study aimed to identify the ways to improve food and nutritional security of pregnant rural women in Pakistan. To achieve this aim, the objectives were to: 1) assess food and nutritional security of pregnant rural women; and 2) identify socio economic factors affecting food and nutritional security of pregnant rural women. Primary data of 135 pregnant rural women were collected randomly visiting basic health units of the district (rural hospitals). Food and nutritional (calories, macro and micro nutrients) security was measured using dietary intake assessment method. A seven days recall method was used to collect necessary information on food intake by the respondents. Dietary intake assessment method is used to measure food and nutritional security of the households. Furthermore, a weighted food security index was calculated which indicated 5 categories i.e. absolute food insecure, severe food insecure, mostly food insecure, mostly food secure and absolute food secure. Eleven percent of the respondents (pregnant rural women) were measured to be absolute food insecure, eight percent were measured to be severely food insecure, 37 percent were measured to be mostly food insecure, 23 percent were mostly food secure and 21 percent were absolute food secure. Food and nutritional security of pregnant women was positively impacted by household income, education level of the pregnant women while family size had a negative impact. It is, therefore, recommended that rural income earning opportunities be provided through promoting rural entrepreneurship and women education.

Keywords: Food and nutritional security; pregnant women; rural women; macro-nutrients; micro-nutrients

Introduction

Food and nutritional insecurity is a phenomenon that is characterized by lack of access to sufficient nutritious food to fulfil the basic requirements of human body (Blumberg et al., 1999; FAO, 2010). Nutritional insecurity is specifically linked to the limitations in the frequency, quantity and quality of food consumption (Montgomery, 2003). Nutritional security is important for every stage of human life i.e. from conception till the old age (Wahlqvist, 1995).

Proper nutrition is essential for healthy fetal growth (Ohta et al., 2008). It is achieved by consuming balanced diet from all food groups that provide enough quantities of proteins, carbohydrates, fats, vitamins etc. (Haas, 2002). Every day a pregnant women needs to consume high quality and a well-balanced diet containing 80 g to 100 g of proteins, sufficient water, an appropriate salt to taste and calories from all foods (Brewer and Brewer, 1985). Her daily food consumption must include meat (fish), dairy products, nuts, green and yellow vegetables, fruits, whole grain bread, and water. This will not only provide essential macro and micro nutrients but also prevent pregnancy complications (Dunne, 1990; Frye, 1993; 1995)

Adequate nutrition sustainability is very important to overcome hunger and poverty (Sachan et. al., 2005). In developing countries, 50% of the children under five are malnourished and suffer from stunting compared to only five percent in developed countries (World Bank, 2001; Tesfahun, 2005). Malnutrition during pregnancy causes adverse impacts on the health of the newborns (WFP, 2011). In Pakistan the nutritious situation of pregnant women and children below five years of age is extremely poor (NNS, 2011).

Food and nutrition security has been a topic of concern for both the policy makers and researchers. In Pakistan, researchers have focused on food (calorie) security and have ignored the macro and micro nutrient assessment. Furthermore, the emphasis remained on household or macro level. The individual level food and nutritional security received little or no attention by the researchers. Lack of balanced diet consumption along with low quality and hazardous food and water intake, could cause major issues especially to the pregnant women and the newborns. The objectives of the study were to: assess food and nutritional security situation of rural pregnant women; and to identify the factors affecting food and nutritional security.

Material and methods:

A stratified random sampling technique was used to collect data from two tehsils of district Faisalabad. Basic health units were visited to

interview 135 pregnant women. Both quantitative and qualitative information regarding food and nutritional security was collected through a well designed interview schedule. Dietary Intake Assessment (DIA) method was used to measure food and nutritional security. The food consumption information was collected using a 7 days recall method. Calories were calculated using the conversion table of AIOU (2001). The calculated per capita calories were converted into adult equivalents to tackle the age and gender related issues. Analysis was done for the pregnant women and as well as for the household. A threshold level suggested by the Government of Pakistan and according to the WHO recommendations were used for the study i.e. 2450 Kcal per person per day (GoP, 2003). A household and pregnant women whose per capita calorie intake is equal to or greater than the threshold level was considered as food secure and vice versa. Mathematically it can be written as:

$$FS_i = \sum Cc - T \geq 0 \quad (1)$$

Where;

FS_i = Food Security Status of ith household

$\sum Cc$ = Calculated per capita calories intake (per adult equivalent units)

T = GoP's Threshold level for rural areas i.e. 2450 Kcal/Person/day (GoP, 2003)

Similarly, for nutritional (utilization) security, macro nutrients and micro nutrients intake were calculated using the conversion table of AIOU (2001). The calculated nutrients were converted into adult equivalent using the NSSO's (1995) conversion table. A micro and macro nutrient was calculated in the same manner as calorie calculations and appropriate threshold level was used from health department Government of Pakistan (GoP). A pregnant women or household who is deficient in any of these nutrients will be considered as nutritionally insecure.

Mathematically, more general equation for macro and micro nutrients can be written as:

$$NS_{ij} = \sum CM_{ij} - T \geq 0 \quad (2)$$

Where;

NS_{ij} = nutritional security status of ith micro and macro nutrients for jth pregnant women and households.

CM_{ij} = calculated per capita ith micro and macro nutrients intake for jth household and pregnant women (per adult equivalence units)

T = threshold level defined by WHO/Government of Pakistan (70g for protein, 180g for carbohydrates, 80g for fats, 15mg for iron, 15g for zinc, 1000mg for calcium and 1000mg for phosphorus)

Alkaire and Foster method (Foster et al., 2010) was used to measure food security index among pregnant women in this study. It is a smooth and robust technique. The advantage of food security index is that it is very easy for understanding the concept of absolute food insecure, severely food insecure, mostly food insecure, mostly food secure and absolute food secure. This index provides better picture of food security status of pregnant women.

This study used three categories of food security: energy (calories), macronutrient and micronutrient. Macronutrient consists of three nutrients: protein, fats and carbohydrates. Micronutrients consists of four nutrients; iron, zinc, calcium and phosphorus. Weights were given to these three categories according to their importance for pregnant women. In the light of literature review, micronutrients are more important for pregnant women. So, they were weighted accordingly.

Table 1 Weights assigned to nutrients

Name	Weight	Food & Nutrition	Weight
Energy (Cal)	0.3	Calories Intake	0.3
Macronutrient	0.3	Protein Intake	0.1
		Fat Intake	0.1
		Carbohydrate Intake	0.1
Micronutrient	0.4	Iron Intake	0.1
		Zinc Intake	0.1
		Calcium Intake	0.1
		Phosphorus Intake	0.1
Total weight	1.0		1.0

Multinomial Regression

Multinomial logistic regression is a simple extension of binary logistic regression that allows for more than two categories of the dependent or outcome variable. Like binary logistic regression, multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership. In the model, food security index is dependent variable with seven independent variables. It is shown in equation form;

$\delta i\ (Y) = \beta o + \beta 1TEHi + \beta 2THMi + \beta 3EoRi + \beta 4Ii + \beta 5DMFCi + \beta 6FSi + \beta 7GoHHi$ (3)

Where;

$\delta i\ (Y)$ = Probability of ith pregnant women to become food secure

βo = Constant Term

$\beta 1\text{-}7$ = Coefficients of the explanatory Variables.

TEHi = ith no of total earning hands of households

THMi = ith no of total households members

EoRi = Education level of ith pregnant women

Ii = Total monthly income of ith household

DMFCi = Decision making of ith household regarding food consumption (dummy '1' = male and '0' = Female.

FSi = Family system of ith households (dummy '1' = Joint and '0' = Nuclear)

GoHHi = Gender of household head (dummy '1' = male and '0' = Female)

Results and discussion:

Food and nutritional sufficiency:

It was found that 21% of the respondent women were calorie insufficient. The majority of the women were deficient in macro and micro nutrient consumption which is an indication of the possibility of complications during pregnancy and health hazards to the fetal and new born babies. It was found that 45% of the respondents were protein deficient, 17% were carbohydrate deficient and 31% were fats deficient. The situation of micro nutrient intake was even worse as 43% of the respondents were iron deficient, 58% were zinc deficient, 76% were calcium and 42% were phosphorus deficient.

Descriptive statistics

A huge variation was seen in food intake as the mean calorie intake was 3002 KCal which is above the threshold level of 2450 KCal. This shows that overall the respondents' calorie intake was adequate. The lowest calorie intake was recorded as 672 KCal which indicates starving. At this level of intake, the individual cannot sustain a healthy life. In case of targeted population, i.e. pregnant women, this low intake may harm the development of the fetal and may lead to stunted growth of the newborn baby (Barker, 2001). This will in turn reduce the survival chances of the baby by the age of five years. On the other hand, the highest calorie intake was recorded as 13,725 KCal. This is too high and may have adverse impacts on fetal development and have negative complications to the health of a baby (Corleone, 2015). Similar situation were observed for macro nutrients except for carbohydrate where the average intake was above the threshold level. But, the variations were too high ranging from 86g to 1103g. While the average intake of proteins and fats was recorded as 66g and 113g, respectively. This is low than the recommended threshold level in case of protein and adequate in case of fats. The minimum intake was 16g of protein and fats, is alarmingly low. On the other hand, the maximum intake was 339g of proteins and 797g of fats which is too high. Low consumption of macro nutrients may cause serious complications to fetal development (Saldana et al., 2004).

Table 2 Descriptive statistics

	Minimum (Kcal)	Mean	Maximum
Calories	672	3002	13,725
Macronutrients			
Protein	16	66 (51)	339
Carbohydrates	86	355 (180)	1103
Fats	16	113 (136)	797
Micronutrients			
Iron	3	24 (20)	121
Zinc	5	18 (13)	87
Calcium	126	824 (856)	6614
Phosphorus	382	1494 (1222)	8872

Figures in parentheses are percentages

The situation of micronutrients intake was also similar to the above trends. The average intake of zinc and calcium was below the threshold levels implying dangerous situation in terms of fetal development. Great variations were also recorded which is not a good sign for fetal development and may cause serious issues after birth (Darnton-Hill and Mkparu, 2016).

Food Security index

Food security index was calculated to reflect all the nutrients into one index. Five categories were

defined with slight adjustments to the values. Zero was considered as absolute food insecure i.e. deficient across all the 8 nutrients. Those who were deficient in majority of the nutrients were considered as severely food insecure (0.25). Those who were deficient in 4 nutrients were considered as mostly food insecure (0.50). While, those who were sufficient in most of the nutrient consumption were regarded as mostly food secure (0.75) and those who were sufficient across all the 8 nutrients were considered to be absolute food secure. The results showed that a good majority of the respondents were food insecure i.e. 56%. Out of which 11% were absolute food insecure, 8% were severely food and nutritional insecure, and 37% were mostly food insecure (Table 3).

Table 3. Food Security Index

Food Security Index	Frequency	Percent
Absolute food insecure (0.0)	15	11
Severely food insecure (0.25)	11	8
Mostly food insecure (0.50)	50	37
Mostly food secure (0.75)	31	23
Absolute food secure (1.00)	28	21
Total	135	100

Multinomial regression results

The results of the Multinomial regression are shown here in Table 4. The values of Cox and Snell and Nagelkerke R square (also known as Pseudo R square) shows that the model shows variation as 48 percent and 50 percent respectively.

The results of the study are explained in terms of multinomial regression. Food security index is used as dependent variable. It has been categorized as absolute food insecure, severe food insecure, most food insecure, most food secure and absolute food secure. A sample of 135 respondents may be of these four categories. The significance, standard error and coefficient of variables are presented in the table given below.

Total Earning Hands: Total earning hands are the total number of individuals who are earning money in a house. As one earning hand increases, the chances of getting absolute food insecure decrease by 0.31 times. The result show with an increase of one earning hand, the chances of getting absolute food insecure from severe food insecure decrease by 1.02 times. As an increase of one percent in total earning hands, absolute food insecurity from mostly food insecurity decrease by 0.49 times and absolute food security from mostly food secure decrease by 0.53 times. So, it represents positive relation between total earning hands and food security. It implies that as total earning hand increases absolute food insecurity decreases and people move towards food security.

Family size: Family size represents the number of peoples who live together in a specific boundary of a house. The coefficient of this variable for different food security index represents that as total number of household members increase by one percent the chances of getting absolute food insecure increase by 0.31 times. With an increase of one member in total households, absolute food insecurity of pregnant women from severe food insecurity increase by 0.29 times. Pregnant women are getting absolute food insecure from mostly food insecure by 0.32 times as one more person enters into household members. The chances of getting absolute food insecure from mostly food secure increase by 0.06 times for pregnant women as an addition of one member in households. This situation implies a negative relationship between food security index and total household members. It explains the pregnant women are getting more absolute food insecure as total households members expands.

Education of Respondent: Education of respondent has significant impact on food security status of pregnant women. The results imply that if pregnant women are more educated or education increases by one grade the absolute food insecurity decreases by 0.08 times. With an increase of one grade in education, absolute food insecurity from severe food insecurity decreases by 0.06 times. The chances of getting absolute food insecure from mostly food insecure decrease by 0.13 times as an increase of one class in education. With an increase of one class in education of pregnant women absolute food insecurity from mostly food security decreases by 0.18 times. So education has a positive relationship with food security index, it means as education increase absolute food insecurity decrease.

Income: Income is the total monthly earning which is earned by the members through various sources. With an increase of 1000 rupees in income, absolute food insecurity decrease by 0.26 times for pregnant women. It seems as monthly income rise by 1000 rupees of a family, the chances of getting absolute food insecure from severe food insecure decreases by 0.15 times of pregnant women. Absolute food insecurity of pregnant women from mostly food insecurity decreases by 0.088 times as monthly income of household increase by 1000 rupees. The chances of getting absolute food insecure from mostly food secure decrease by 0.037 times as an increase of 1000 rupees in

income. It suggests positive relationship between income and food security index. It explains as income of household members rise by 1000 rupees, absolute food insecurity decreases and leads the pregnant women towards food security.

Table 5. Socioeconomic factors affecting food security of pregnant women

	Absolute food insecure (0.0)	Severely food insecure (0.25)	Mostly food insecure (0.5)	Mostly food secure (0.75)
Intercept	4.37**	4.01 **	3.28 **	3.00 **
Total Earning Hands	-0.31 ^{NS}	-1.02 ^{NS}	-0.49 ^{NS}	-0.18^{NS}
Family Size	0.31*	0.29 ^{NS}	0.32 *	0.06 ^{NS}
Education	-0.08 ^{NS}	-0.06 ^{NS}	- 0.13 *	-0.18 *
Income	-0.00026 ***	0.00015 ***	0.00008 ***	0.0004***
Decision Making	-0.193 ^{NS}	-18.55 ^{NS}	-2.20 ^{NS}	0.05 ^{NS}
Family structure	-0.54 ^{NS}	-1.19 ^{NS}	-1.29 **	-0.74 ^{NS}
Gender of HHH	0.31 ^{NS}	-17.6 ^{NS}	-0.06 ^{NS}	-2.88 *

***** significant at less than 1%, ** significant at less than 5%,** ^{NS} Non-significant

Conclusion:

This study aimed to identify the ways to improve food and nutritional security of pregnant women. To achieve this aim, food and nutritional security of pregnant women was measured and the factors affecting food security were identified. It was found that 21% of the respondents were food insecure based on calorie intake. Situation was worst in consuming macro and micro nutrients, 45% of the respondents were protein deficient, 17% were carbohydrate deficient, 31% were fat deficient, 43% were iron deficient, 58% were zinc deficient, 76% were calcium deficient and 42% were phosphorus deficient. The food and nutritional security index showed that 56% of the respondents were food and nutritional insecure. Education level of respondents and income had positive impact on food and nutritional security while family size had a negative impact. It is suggested that the education facilities, both formal and informal, should be enhanced in rural areas especially for females.

References:

AIOU., 2001. Food composition table for Pakistan. Allama Iqbal Open University, Islamabad, Pakistan.

Barker, D.J.P. 2001. The malnourished baby and infant: Relationship with Type 2 diabetes. British Medical Bulletin, 60(1): 69-87.

Blumberg, S.J., K. Bialostosky, W.L. Hamilton, R.R. Briefel. 1999. The effectiveness of a short form of the household food security scale. American Journal of Public Health, 89:1231–4.

Brewer, G.S. and T. Brewer, 1985. What eve pregnant women should know: the truth about diet and drugs in pregnancy. New York: Penguin Books.

Corleone, J. 2015. The Effects of Over-Eating During Pregnancy. Live Strong Foundation, Austin, Texas, USA.

Darton-Hill, I. and U.C. Mkparu. 2016. Micronutrients in Pregnancy in Low- and Middle-Income Countries. Nutrients, 7(3): 1744-1768.

Dunne, J.L. 1990. The nutrition almanac, 3rd edition, New York: Nutrition Search, Inc., McGraw-Hill Publishing.

FAO, 2010. Food insecurity in the World: addressing food insecurity in protracted crises. Food and Agriculture Organization of the United Nations, Rome, Italy.

Foster, J., J. Greer and E. Thorbecke. 2010. The Foster–Greer–Thorbecke (FGT) poverty measures: 25 years later. The Journal of Economic Inequality, 8(4): 491-524.

Frye, A. 1993. Understanding Diagnostic Testing the Childbearing Year. 5th edition. Portland, OR: Labrys Press.

Frye, A. 1995. Unraveling Toxemia. Midwifery Today and Childbirth Education, 34: 22-24.

GoP. 2003. Economic survey of Pakistan, 2002-03. Ministry of Food and Agriculture. Finance Division, Economic Advisor's Wing, Islamabad, Pakistan.

Haas, A.V., 2002. Nutrition during Pregnancy. Midwifery Today, The Heart and Science of Birth. online available at https://www.midwiferytoday.com/articles/nutritionpreg.asp accessed on 10/02/2017.

Montgomery, K. S. 2003. Improving nutrition in pregnant women and adolescents: Recommendations for Clinical

Practitioners. The Journal of Perinatal Education, 12 (2):22-30.

NNS, 2011. National Nutritional Survey Pakistan. Nutrition Wing, Cabinet Division, Government of Pakistan, Islamabad, Pakistan.

NSSO. 1995. Measurement of poverty in Sri Lanka. National Sample Survey Organization of India.

Ohta, H., S. Xu, T. Moriya , M. Iigo, T. Watanabe and N. Nakahata. 2008. Maternal Feeding Controls Fetal Biological Clock. PLoS ONE, 3(7). doi:10.1371/journal.pone.0002601

Sachan A., R. Gupta, V. Das, A. Agarwal, P.K. Awasthi, V. Bhatia, 2005. High prevalence of vitamin D deficiency among pregnant women and their newborns in northern India. The American Journal of Clinical Nutrition (2005); 81: 1060-1064.

Saldana, T.M., A.M. Seiga-Riz, L.S. Adair. 2004. Effect of macronutrient intake on the development of glucose intolerance during pregnancy. The American Journal of Clinical Nutrition, 79(3): 479-486.

Tesfahun, M.A. 2005. Rural poverty situation and determinants: the case of Kersa Kondaltity Woreda, Southwest Shewa. Masters Thesis, Addis Ababa University, Ethiopia.

Wahlqvist, M.L. 1995. Nutrition and aging. Nutridate, 6(1): 1-5

World Bank. 2001. World Development Report 2000/2001: attacking poverty. The World Bank, Washington DC, USA.

WFP. 2011, Gender Rapid Assessment Report, Gender Issues in Food and Nutrition Security in Nusa Tenggara Timur Province, World Food Programme Indonesia Country Office.